

Orbital Debris: Past, Present, and Future

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In the early days of spaceflight, the “Big Sky” theory was the near universally accepted paradigm for dealing with collisions of orbiting objects. This theory was also used during the early years of the aviation industry. Just as it did in aviation, the “Big Sky” theory breaks down as more and more objects accumulate in the environment. Fortunately, by the late 1970’s some visionaries in NASA and the US Department of Defense (DoD) realized that trends in the orbital environment would inevitably lead to increased risks to operational spacecraft from collisions with other orbiting objects. The NASA Orbital Debris Program was established at and has been conducted at Johnson Space Center since 1979. At the start of 1979, fewer than 5000 objects were being tracked by the US Space Surveillance Network and very few attempts had been made to sample the environment for smaller sizes. Today, the number of tracked objects has quadrupled. Ground-based and *in situ* measurements have statistically sampled the LEO environment over most sizes and mitigation guidelines and requirements are common among most space faring nations. NASA has been a leader, not only in defining the debris environment, but in promoting awareness of the issues in the US and internationally, and in providing leadership in developing policies to address the issue. This paper will discuss in broad terms the evolution of the NASA debris program from its beginnings to its present broad range of debris related research. The paper will discuss in some detail current research topics and will attempt to predict future research trends.